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Symposium Proceedings

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Milestones of Pharmaceutical Botany

Pre-history to 1900

*by Ara H. DerMarderosian**

THERE is little doubt that the task of presenting a review of milestones in pharmaceutical botany from pre-history to 1900 is a daunting and challenging task. However, even a cursory overview has value from the standpoint that looking back from the year 1995 can be a guide to where we have been and where we are going. Each period of history has its lessons and it will be my challenge to present a few of these from the past. By now, almost every culture around the world has had a chance to note their individual contributions to pharmacy and medicine. Articles abound on historical and archeological finds from many cultures on the beginnings of man's interest in plants as food and medicine.[1] In addition, major recurring themes and lessons in the history of pharmaceutical botany emerge even from a cursory review of historical events.

There were many early discoveries of a similar nature on pharmaceutical botany from all world cultures. The oldest prescriptions found on Babylonian clay tablets as well as the hieratic (priestly) writings of ancient Egypt on papyrus show the ancient medical uses of olive oil, wine, beer, yeast, vinegar, turpentine, figs, castor oil, myrrh, mastic, frankincense, wormwood, aloes, opium, cumin, peppermint, cassia, caraway, coriander, anise, fennel, saffron, lotus flowers, linseed, juniper berries, henbane, mandragora, poppy, gentian, colchicum, squill, cedar, elderberries, honey, grapes, onion, and date blossoms. There is little doubt that this botanical cornucopia represented the best collection of medicines from several cultures brought to bear on the ever enlarging and unifying peoples and their ills of the "wide" world at that time. Most cultures have ancient and still extant uses of similar plant medicines for similar disorders. Major useful and unique plants were widely and rapidly advanced to major use status (e.g., opium, castor oil, and aloe). Folkloric uses of phytomedicines persist worldwide.

Milestones

Archeological findings from 30,000 years ago in Shanidar in Iraq show pollen and plants that are still used in traditional medicine of these parts of Asia, e.g., yarrow, holly-hock, groundsel, grape hyacinth, St. Barnaby's thistle, and joint pine.

Throughout the ancient period major personalities documented the unique properties and uses of medicinal plants. The medical writings of the time included: the Code of Hammurabi (2250 B.C.); the Kahun papyrus dealing with veterinary medicine (2000 B.C.); the Edwin Smith Papyrus for surgery and internal medicine (1600 B.C.); the Papyrus Ebers which deals with pharmacy, listing important plants in Egyptian medicine (at least 160), e.g., senna, poppy, colocynth, and castor oil (1552 B.C.). The Chinese *Pen-ts'ao* (Materia Medica) and related publications attributed to the mythical emperor Shen Nung and others which mention hundreds of plant drugs including ephedra (Ma huang), *Dichroa febrifuga*, and chaulmoogra oil (2000-1000 B.C.). In the Veda (books of knowledge) of India there were listed botanical prescriptions for "cures" for all the maladies of the time. The Susruta (1300 B.C.) gives myriads of drugs, e.g., opium, rauwolfia, nux vomica, aconite, and hashish. Other important figures whose writings were influential include Aristotle (360 B.C.); Theophrastus, the "father of botany," who wrote *De Historia Plantarum* (300 B.C.); and Mithridates, the King of Pontus and an early student of toxicology (80 B.C.). Around A.D. 60, Pedanius Dioscorides, physician in the time of Nero, traveled to Egypt, Africa, Spain, and Italy where he gathered information on botanicals and medicine (*De Materia Medica*). His work spread widely in the Roman and Arab world and exercised a great influence through the Middle Ages. It lists about 500 drugs of vegetable origin (e.g., pyrethrum, rue, scammony, squill, nutgall, and over 100 animal drugs). Galen, Rome's most celebrated physician wrote circa A.D. 150.

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During the Middle Ages, religious orders propagated and preserved living plants in monastic gardens for use in medicine. A discussion of medicinal herbs can also be found in the writings of Alexander of Tralles, who used rhubarb, cantharides, and colchicum in medicine (550); the studies of Rhazes, head of the hospital at Baghdad and author of many studies on plants used in pharmacy (c. 875); the *Herbarium* of Apuleius Platonicus, one of the earliest manuscript herbals (950), as well as *Hortulus*, another herbal; the writings of Avicenna (c. 1000); the studies of Avenzoar who opposed the teachings of Galen (c. 1140); and the writings of Maimonides (c. 1160).

In the eleventh century A.D. the writings of Avicenna, Averroes, and other Arabs allied with data from India raised Arabic medicine to high levels. Through Spain, this spread all over Europe with many new medicines added, e.g., areca nut, cinnamon, musk, manna, nux vomica, tamarind, and camphor.

Milestones in history that affected the development of pharmaceutical botany include: the appearance of universities (e.g., Oxford in 1167 and Padua in 1222) and guilds (e.g., Guild of Pepperers in London, which included drug dealers, 1180); the works of Albertus Magnus on alchemy and Roger Bacon on predictions in science (1250); the books of Gerard of Cremona on translations of medical and pharmaceutical works (1260); and the travels of Marco Polo (1275) who revealed many of Asia's foods and medicines to Europeans.

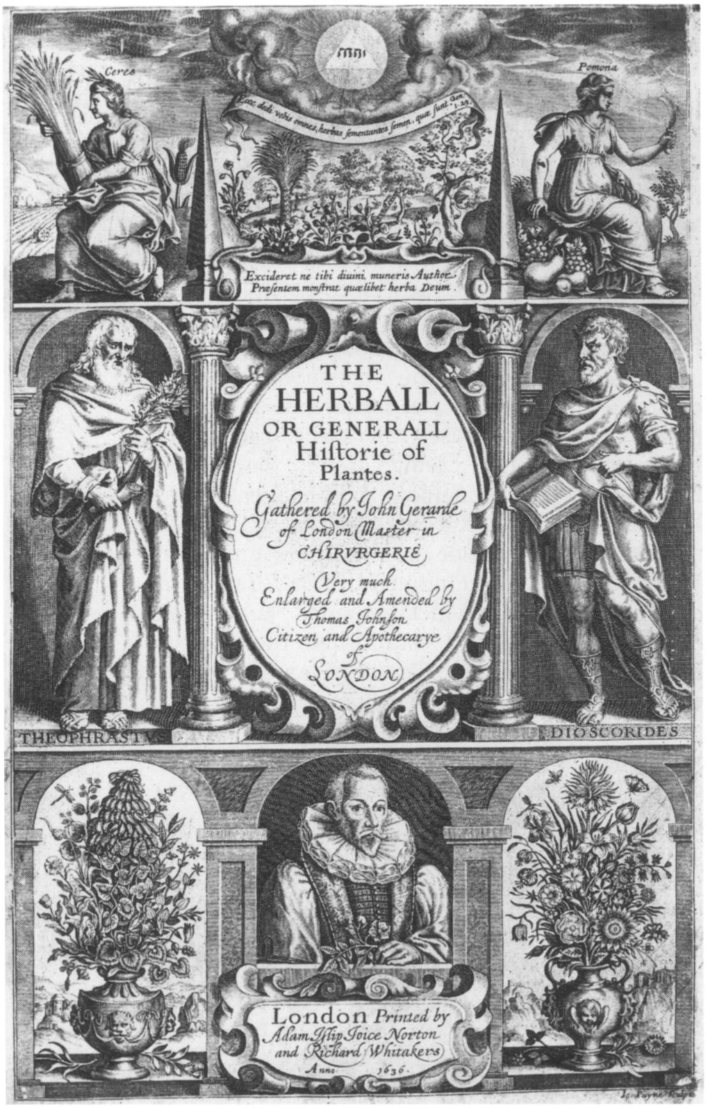
The geographical discoveries of the sixteenth and seventeenth centuries brought new drugs (tobacco, cinchona, tea, and coffee) and opened a new era. The great maritime cities of Genoa, Venice, and Marseilles monopolized early modern European drug trade.

Also in the sixteenth century, we find Paracelsus, a Swiss physician, who is often considered the founder of pharmaco-chemistry. He was among the first to teach about extraction from drugs and the notion of active principles in plant medicines. A great number of drugs came to be added to old ones so that it became necessary to carry out vast revision of old drugs and undertake more exact studies of the new ones.

In sixteenth-century Europe we find the appearance of important herbals: Banckes (1525), *The Grete herball* (1526), Brunfels (1530) and Gerard (1597), which advanced phytomedicine; and the founding of famous botanical gardens such as those of Florence (1544), Bologna (1547), and Paris (1570); and the introduction of tobacco into Europe from the Americas by Nicot (1560).

Older prescription books, antidote books, and dispensaries led to pharmacopeias, official pharmaceutical codes for a city, state, or group of states. Vegetable drugs dominated these publications.

Important scientific developments of the early modern period include the first microscopic description of plant cells by Robert Hooke (1667) and related studies by Leeuwenhoeck (1673); the botanical explorations and establishment of Bartram's botanical



Ecce, dedi vobis omnes herbas ſementantes ſemen, quæ ſunt. Gen. 1.29.

Excideret ne tibi diuini muneris Author
Præſentem monſtrat quælibet herba Deum.

THE
HERBALL
OR GENERALL
Hiſtorie of
Plantes.
Gathered by John Gerarde
of London Master in
CHIRVRGERIE
Very much
Enlarged and Amended by
Thomas Johnſon
Citizen and Apothecarye
of
LONDON

London Printed by
Adam Iſlip Ioice Norton
and Richard Whitakers
Anno 1636.

The frontispiece of this 1636 herbal shows the author's debt to the work of Theophrastus and Dioscorides in the study of plants and their uses.

garden in Philadelphia (1715); the concepts of classification and collections of Linnaeus (1740); Marggraf's isolation of sugar from beets (1747); Priestley's discovery of oxygen (1770), Cavendish's synthesizing water (1781), Withering's introduction of the infusion of digitalis into medicine (1785); and Johann Schoepf's publishing *Materia Medica Americana* (1787).

A more solid scientific basis emerged in the nineteenth century for the analysis and use of drugs found after isolation and study of their active principles: Scheele's separation of the first organic acids (oxalic, malic, and tartaric), Sertürner's isolation of morphine from opium (1805), Pelletier and Caventou's isolation of strychnine from nux vomica (1818) and quinine from cinchona (1820), Robiquet's isolation of caffeine from coffee (1820), Leroux's isolation of salicin from willow (1830), and Nativelle's crystallization of digitalin from foxglove (1869). As physiology developed, drug effects on animals and humans grew into pharmacology. The studies of Magendie (1809) on poisons of *Strychnos* on animals, and actions of ipecac and emetine appear. Claude Bernard (1813-1888) developed drug assays using animals.

The increased need for specialization developed and disciplines started to separate from the primary sciences. Each area assumed the characteristics of autonomous subjects. The term pharmacognosy made its appearance in 1815 when C. A. Saydler adopted it in the title *Analecta Pharmacognostica*, a brief dissertation on some classical drugs published at Halle. Others adopted it until it replaced the older term, materia medica. Pharmacognosy developed into a focused study on the morphological and chemical characteristics of botanicals and other natural products. Based on earlier works by Phoebus, Wilbrand, Liebig, Merck, Buchheim, Schmiedeberg, Schleiden, Flückiger, and Hanbury, the well known Alexander Tschirch (1856-1939), Professor of Pharmacognosy in Bern published his monumental work *Handbuch der Pharmacognosie*, which extended the concept of this discipline and established the various branches to include cultivation and preparation, sources, packing, morphological systematics, anatomy, physiology, cytology, genetics, vegetable pathology, pharmacozoology (animal drugs), phytochemistry, physics, pharmaco-geography, history, ethnology, and etymology.

Leading from the nineteenth into the twentieth century, milestones include: the founding of the Philadelphia College of Pharmacy (1821); Wöhler synthesizing urea from ammonium cyanate and helping to eliminate distinctions between organic and inorganic chemistry (1828); Darwin publishing his *Origin of Species* (1859); Pasteur's studies in microbiology that bring an end to ideas of spontaneous generation and humoral medicine (1860-1880s); the beginning of the end of botanical patent medicine excesses with the Food and Drugs Act in the United States (1906)[1]; the contributions of John Uri Lloyd on the history of the vegetable drugs of the *U. S. Pharmacopeia* (1911)[2]; and the studies and botanical explorations of Henry Rusby (1880s).[3] Several recent texts have also reviewed botanical medicine,[4] and each has given valuable perspectives to this long and complex story. One recent article by De Pasquale has reviewed the history of pharmacognosy contending that it is the "oldest" modern science.[7]

Recurring Themes and Lessons

What can be drawn from these historical milestones? It is obvious that man from the earliest times recognized the value of certain vegetables, animals, and minerals as drugs or "tools." The recurring themes following from this are legion and continue to this day. Different cultures and nationalities of the world took "turns" at promoting various aspects of medicine through their own phytotherapeutics. In many cases folkloric practices were maintained (Asia and Europe) while others disdained those approaches (e.g., modern United States) through feelings of cultural and scientific arrogance based on early successes with pure isolated constituents from plants and some semisynthetic drugs. Few dispute the fact that knowledge of plant medicine is very old going now as far back as Shanidar. As societies advanced through the subsequent ages in the world, many dominant personalities in religion and science developed the concepts of influencing bodily functions through outside forces. Centuries later this led to the rational medicine of today with continuing elements of religion and the relatively new concepts of psychoneuroimmunology (PNI).

The widening world continues to recognize that discoveries come from everywhere. Most ancient cultures had similar plants which produced similar effects wherever they were used. The continuing study of ethnobotany shows the need to properly identify plants as to correct genus, species, and varieties and even chemovars. The early herbals gave way to modern color photography. Computers have now been brought into play to categorize and help identify plants. The complex phytochemistry of biologically active constituents have taught us that each plant is a veritable chemical factory. Early pharmacopeias, as today, tried to standardize botanical medicines. This was found to be difficult because of the variability of plants as to correct identification, proper collection, storage, transport and extraction for standardized dosage forms containing well characterized active principles. We now know that each constituent is produced by complex biosynthetic routes and often decades are needed to successfully ascertain which ones are present and which ones have specific pharmacological properties.

Often new physiological and pharmacological concepts were developed as new compounds and were recognized as "molecular keys." Older medicines and treatments have recycled, such as acupuncture when it was discovered that endorphin release occurred during its use and partly explained its value. The same was seen with capsaicin from hot peppers previously used as a counter irritant and now reintroduced because it is known to deplete newly discovered "substance P," which is involved in pain transmission.

There is a constant recycling of interest in nature as a source of new medicines. Throughout the rapid history presented here, there are many signs of re-interest in plants whenever a new active molecule is found. We now know that we are in a race with our pathogenic microbes to continuously find new antibiotics against them which they continuously have learned to overcome. New pandemic diseases such as AIDS, while disastrous now, do teach us about our immune system. Unique new anticancer principles from plants are sought continuously from nature and folklore.

Another view of all this history shows the human struggles for control over who runs the "medical machine." It took centuries for physicians, pharmacists, nurses, dietitians, and herbalists, to decide who is "in charge" and which medicines are best. We still see this today as modern economic conditions drive us to simpler and less expensive medicine. Some day it will truly be recognized that the control of disease is complex and that multidisciplinary modalities will always be needed for treatment. It is obvious that as people become more educated they will have to take on more responsibility for their own health problems guided by several professionals in the many areas of medicine. The current resurgence of alternative medicine is a good example where professional medical guidance is sorely needed to separate the "wheat from the chaff" on which modalities really work and why. We also need to recognize that human curiosity and "self-experimentation" will always be with us. Our fellow "guinea pigs" experimenting with untested herbs need to be counseled and records kept of their successes and adverse reactions.

The current herbal renaissance is a good example where ancient herbs and foods (e.g., garlic, ginseng, ginger, feverfew, and ginkgo) are being promoted as bona fide medicines and nutraceuticals. Perhaps through epidemiological approaches we can find if and how these work because the lack of a profit motive precludes focused industrial research on them. We need also to recognize that this may be the only relatively simple way we can ascertain the value of complex mixtures over single entities. The future is constantly shaped by both global and local events, which can be sociopolitical, environmental, or economic. These milestones foretell the need to pay attention to all these factors. All of us in science and medicine will have to vote intelligently and act professionally on major emerging issues such as overpopulation, pollution, overuse of limited resources, ozone depletion, ruination of rain forests, and the appropriate handling of the new found freedoms of countries formerly associated with communism.

This cursory view of botanical and medical milestones hopefully will serve as a continuing guide to future advancement as we rediscover anew each generation, the extensive lessons of the past and their appropriate application to future problems.

References

1. La Wall, C.H., *Four Thousand Years of Pharmacy* (J.B. Lippincott Co., 1927).
2. Lloyd, J.U., *History of the Vegetable Drugs of the Pharmacopeia of the United States*, Published by J.U. and C.G. Lloyd, *Bulletin of the Lloyd Library of Botany, Pharmacy and Materia Medica*, No. 18, Cincinnati, Ohio, 1911.
3. Trease, G.E., "Henry Hurd Rusby," *Br. J. Pharm. Pract.* 5 (1983):32,34.
4. Marks, G. and Beatty, W.K., *The Medical Garden* (New York: Chas. Scribner's & Sons, 1971); Van der Zee, B., *Green Pharmacy: A History of Herbal Medicine* (New York: Viking Press, 1982); Bellamy, D.J. and Pfister, A., *World Medicine: Plants, Patients, and People* (Oxford, UK: Blackwell Publishers, 1992).
5. De Pasquale, A., "Pharmacognosy: The Oldest Modern Science," *J. Ethnopharmacology* 11 (1984):1-16.